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Suppose now that x and y are both odd. Let $x = 4k \pm 1, y = 4l \pm 1$. Then $x^2 + y^2 = 16(k^2 + l^2) + 8(\pm k \pm l) + 2$, which is divisible by 2 but not by 4; and $x^2 - y^2 = 16(k^2 - l^2) + 8(\pm k \pm l)$, which is divisible by 8. Since $z^3 = (x^2 + y^2)(x^2 - y^2)$, it is divisible by 16 and hence by 64; and $x^2 - y^2$ by 32. Accordingly, we may write $x^2 + y^2 = 2\alpha^3$, $x^2 - y^2 = 32\beta^3$. We now see that if $x = 4k + 1$, $y = 4l + 1$, then $x + y$ is divisible by 2, but not by 4; any other combination of signs leads to this result for $x + y$ or $x - y$. We may then write, in the one case, $x + y = 2\gamma^3$, $x - y = 16\delta^3$. The other case may be similarly treated. Then

$$(x + y)^2 + (x - y)^2 = 4\gamma^6 + 256\delta^6 = 2x^2 + 2y^2 = 4\alpha^3.$$

Hence $\gamma^6 + 64\delta^6 = \alpha^3$, or $(\gamma^2)^3 + (2\delta^2)^3 = \alpha^3$, which is impossible. Hence there are no integral values of x and y *prime to each other* which satisfy the given equation.

Also solved by J. L. Riley

QUESTIONS AND DISCUSSIONS.

Edited by U. G. Mitchell.

At the time of making up copy for this issue replies had not yet been received for numbers 4, 8, 11, 12, 13, 16, 18.

NEW QUESTIONS.

22. What can the Colleges do toward improving the teaching of mathematics in secondary schools?

23. What should be done with the theory of limits in elementary geometry? Should the recommendation of the National Committee of Fifteen on Geometry Syllabus be universally adopted? If not, what better disposition of the subject can be made?

REPLIES.

10. What use has been made of regular conference periods for assistance to individual students of secondary and college mathematics, and what services may they render?

Reply by Clyde S. Atchison, Washington and Jefferson College.

For the past two years, one hour each day has been set aside for conference in mathematics, during which time one member of the department is in his class room ready to assist students in settling their individual difficulties. The privilege thus offered has been much appreciated by a majority of the students, of whom many seize the opportunity for extra instruction to enlarge their grasp of the subject, while others, of less ability or unfortunate preparatory training, make use of the occasion to have explained to them those points to which only a limited amount of time can be devoted in the regular class work. A frank announcement in the class room, that no time will be wasted with a man who does not keep up with the work of the course, and that a conference hour is not a time when a man's lessons will be prepared for him, has forestalled any attempt on the part of students to take an unfair advantage of the hour.

The personal touch with the men, in a way which is not possible during the class period, together with what has been accomplished in the way of developing both the weaker students and those of more than average ability, has made these conference hours of inestimable value.

3. In connection with the theory of the conduction of electricity through gases, one is led to the differential equation

$$y\frac{d^2y}{dx^2} + a\left(\frac{dy}{dx}\right)^2 + b\frac{dy}{dx} + cy + d = 0, \tag{1}$$

where a, b, c, d are constants. For unrestricted values of a, b, c, d the solution of this differential equation presents peculiar difficulties, the series solutions obtained by the customary methods having (apparently) too small a range of convergence to be satisfactory from the point of view of electrical theory. The general solution of this equation is wanted in case it can be found. If no general solution is obtained for unrestricted a, b, c, d, it is desirable to know special values of a, b, c, d or special relations among a, b, c, d which make it possible to find the general solution; and this solution is desired in each case.

Reply by Barnem Libby, University of Michigan.

The given equation may be written

$$yy'' + ay'^2 + by' + cy + d = 0. \tag{1}$$

Consider the equation

$$yy'' + ay'^2 + by' + cy = 0. \tag{2}$$

This is equivalent to

$$[ayy' + by]' + y[(1 - a)y' + cx]' = 0. \tag{3}$$

Hence (3) is exact if the coefficient of y is zero; and this is the case if $c = 0$ and $a = 1$.

We then get in (1)

$$[yy' + by]' = - d, \tag{4}$$

whence,

$$yy' + by = - d \cdot x + l, \tag{5}$$

l being a constant of integration.

To integrate

$$ydy + (by + d \cdot x - l)dx = 0, \tag{5'}$$

we put

$$\begin{cases} x = x_1 + \alpha, \\ y = y_1 + \beta. \end{cases}$$

Then $dx = dx_1$, $dy = dy_1$ and (5′) becomes

$$(y_1 + \beta)dy_1 + (by_1 + d \cdot x_1 + b\beta + d \cdot \alpha - l)dx_1 = 0. \tag{6}$$

If now $\beta = 0$ and $d \cdot \alpha = l$, this becomes

$$y_1dy_1 + (by_1 + d \cdot x_1)dx_1 = 0. \tag{6'}$$

Let $y_1 = vx_1$, then $dy_1 = vdx_1 + x_1dv$, and then

$$vx_1(vdx_1 + x_1dv) + (bvx_1 + d \cdot x_1)dx_1 = 0,$$

or

$$v(vdx_1 + x_1dv) + (bv + d)dx_1 = 0, \tag{7}$$

i. e.,

$$(v^2 + bv + d)dx_1 + vx_1dv = 0,$$

or

$$\frac{vdv}{v^2 + bv + d} = -\frac{dx_1}{x_1}, \tag{7'}$$

or

$$\frac{\frac{1}{2}(2v + b) - \frac{1}{2}b}{v^2 + bv + d} = -\frac{dx_1}{x_1}.$$

Hence,

$$\log (v^2 + bx + d)x_1^2 - b\int \frac{dv}{v^2 + bv + d} = k. \tag{8}$$

Evaluating the indefinite integral and substituting the values of v^2 and v, we obtain a solution for y in terms of x.

NOTES AND NEWS.

EDITED BY W. D. CAIRNS.

Mr. JOHN BRANDEBERRY, A.B., Mt. Union College, 1914, and Miss MARVEL C. HORN, A.B., Ohio State University, 1914, have been elected graduate assistants in mathematics at Ohio State University, for the present academic year.

Mr. RAYMOND DU HADWAY, who has been studying at Göttingen the past year was forced to leave Germany on account of the war. He has taken a place to teach mathematics in Washington University, St. Louis, Mo.

Professors PIERRE BOUTROUX and J. H. M. WEDDERBURN, of the department of mathematics, Princeton University, have been granted leaves of absence; the former is enrolled in the French service, the latter in the British service.

At the University of Texas, Dr. DAVID F. BARROW has been appointed instructor in applied mathematics, and Mr. F. A. LA MOTTE instructor in pure mathematics. The new courses being given are: The calculus of variations, by Mr. ETTLINGER; and the mathematics of investment and life insurance, by Professor DODD.

It was proposed to hold the next meeting of the International Commission on the Teaching of Mathematics at Munich, Germany, August 2–5, 1915; but this meeting has been indefinitely postponed on account of the war. The main sub-